NASA Goddard GES DISC Data Services for Supporting Hurricane Research and YOTC

http://disc.gsfc.nasa.gov/hurricane
http://disc.gsfc.nasa.gov/YOTC
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Introduction

This poster describes activities at the NASA Goddard Earth Sciences (GES) Data and Information Services Center (DISC) to support hurricane research and the Year of Tropical Convection (YOTC). Two portals have been developed.

The hurricane portal is designed for viewing and studying hurricanes by utilizing various measurements from NASA. There are four main components: 1) Current conditions; 2) Event based maps and profiles; 3) Science focus; and 4) Map and profile archives. Tools consist of: the Goddard Interactive Online Visualization ANd aNalysis Infrastructure (Giovanni, http://giovanni.gsfc.nasa.gov/) and the Hurricane Data Analysis Tool.

YOTC is a joint 2-year *WCRP)/WWRP/THORPEX* activity of coordinated observing, modeling, and forecasting with a focus on organized tropical convection, its prediction, and predictability. The YOTC portal is designed to facilitate NASA satellite data usage by providing a way the YOTC community can easily read, subset, visualize, access, and harmonize data from multiple space-borne sensors.

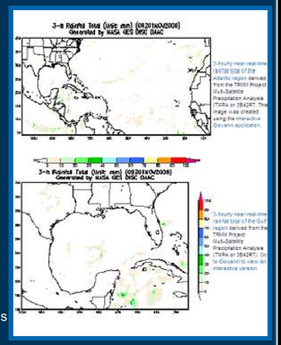
The Hurricane Data Portal: http://disc.sci.gsfc.nasa.gov/hurricane

Current Conditions

Current Conditions on the **Overview** page and the Image Gallery show the latest maps and profiles of pre-selected regions updated daily. Event-based data featuring pictures, animations and summaries of current and past tropical storms or hurricanes is another component.

The site also features links to various tools. The "Image Gallery" contains archives of past storms and the "Hurricane Viewer" has Flash animations of storms and hurricanes. Finally, the "Science" focus includes examples and stories describing the data used in hurricane monitoring and research.

3-hourly near-real-time rainfall totals of the Gulf region are posted on the DISC Hurricane Portal. It is derived from the TRMM Project Multi-Satellite Precipitation Analysis.



Data

Current hurricane-related products available from Giovanni include data from:
- Atmospheric Infrared Sounder (**AIRS**) on the Aqua satellite
- Microwave Limb Sounder (**MLS**) on the Aura satellite
- Ozone Monitoring Instrument (**OMI**) on the Aura satellite
- Moderate Resolution Imaging Spectroradiometer (**MODIS**) on the Aqua and Terra satellites
- Tropical Rainfall Measuring Mission (**TRMM**) satellite
- Total Ozone Mapping Spectrometer (**TOMS**)
- Ocean Color Time-Series Project (**SeaWiFS** and **MODIS**)
- Quick Scatterometer (**QuikSCAT**)

Data Access

The **Data Access** section provides users with 2 methods by which they can easily order data provided by the GES DISC DAAC. One method is called "Mirador," which can search for data by date, parameter, instrument, or any keyword.

Tools

- Giovanni: http://giovanni.gsfc.nasa.gov/
- Hurricane Data Analysis Tool: http://disc.sci.gsfc.nasa.gov/hurricane/trmm_quikscat_analysis.shtml

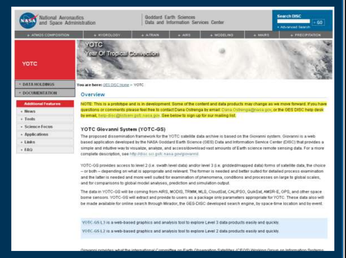
The Year of Tropical Convection (YOTC) Portal http://disc.sci.gsfc.nasa.gov/YOTC

Data

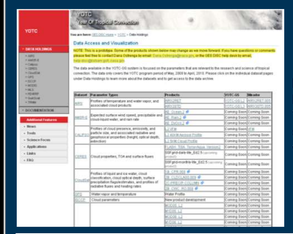
AIRS, AMSR-E, Calipso, CERES, CloudSat, GPS, ISCCP, MODIS, MLS, PEHRRP, QuickSCAT, TRMM

Tools:

- YOTC-GS L3 is a web-based graphics and analysis tool to explore NASA Level 3 data products easily and quickly
- YOTC-GS L2 is a web-based graphics and analysis tool to explore NASA Level 2 data products easily and quickly.



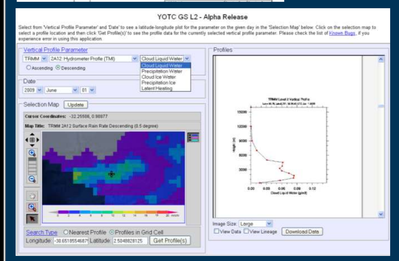
Above: YOTC Web Portal



Left: Data Holdings for YOTC, including data access and visualization,

Above: GUI interface of GIOVANNI YOTC-GS L3. GIOVANNI is the underlying infrastructure for a growing family of Web interfaces that allows users to explore, visualize, and analyze the Earth Sciences data interactively online without having to download any data.

- No need to learn data formats and to retrieve and process data
- Examine and assess various phenomena interactively (minutes versus months)
- Screen various "what-if" combinations of parameters measured by different instruments
- No software installation is needed. All the statistical analysis is viewable via a regular web browser
- Data export for further analysis



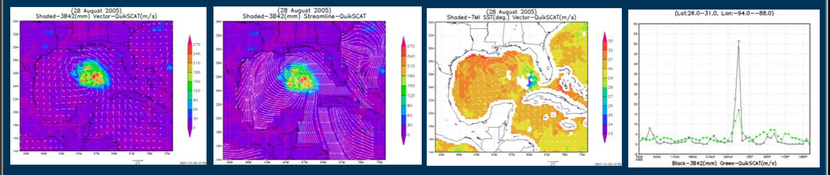
GUI interface of GIOVANNI YOTC-GS L2, allowing an easy access to TRMM, AIRS profile data without data downloading and installation of software.

Online Analysis of TRMM and QuikSCAT Data

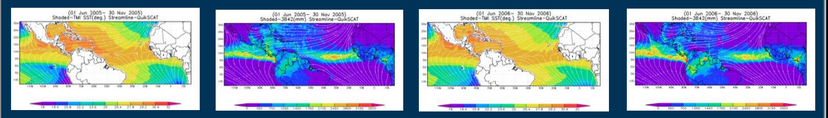
http://disc.sci.gsfc.nasa.gov/hurricane/trmm_quikscat_analysis.shtml

The online tool allows users to visualize and analyze NASA's daily QuikSCAT ocean surface wind, TRMM precipitation and TRMM TMI sea surface temperature data. Data from January 1, 1998 through November 21, 2009 is now available.

Acknowledgements: QuikSCAT ocean surface winds are provided by the Physical Oceanography Distributed Active Archive Center (PO.DAAC). TMI SST data are provided by Remote Sensing Systems.



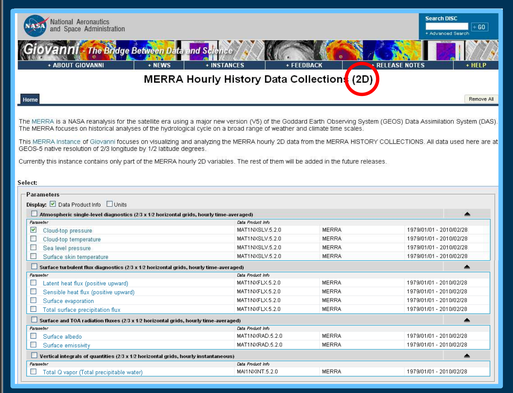
Above: TRMM and QuikSCAT daily data analyses of Katrina.

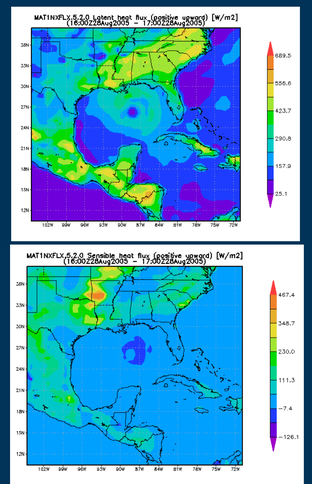


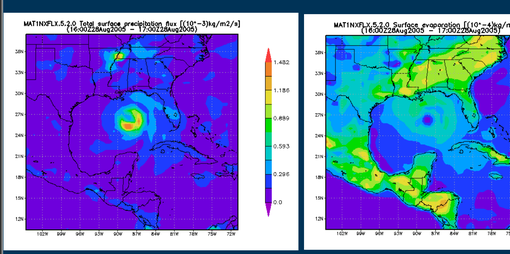
Above: TRMM and QuikSCAT analyses for 2005 and 2006 hurricane seasons.

NEW!!! Studying Hurricanes in Giovanni: MERRA Hourly

- **MERRA Hourly History Data Collections (2D)**
- **MERRA 3-Hourly History Data Collections (3D)**

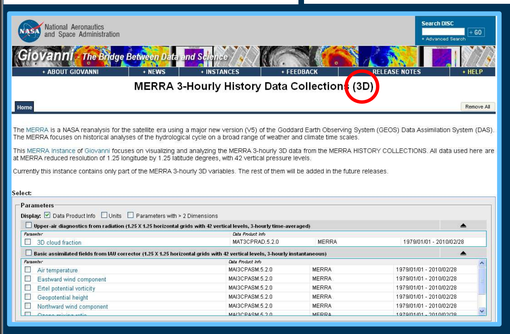


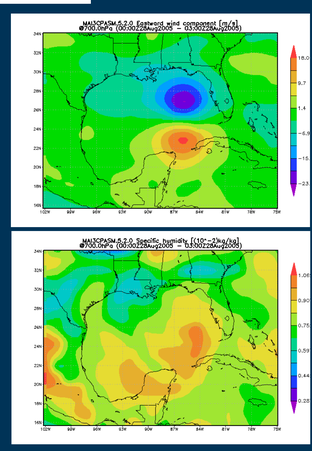




The Modern Era Retrospective-analysis for Research and Applications (MERRA) hourly 2-D parameters can be used in hurricane and other studies.

Above and Left: sample plots for Hurricane Katrina. More parameters will be added.





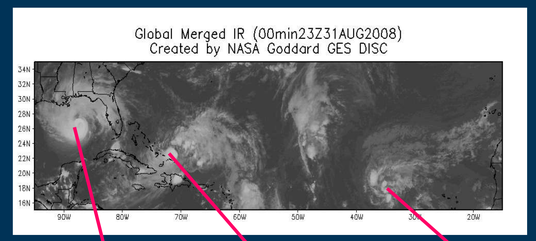
MERRA 3-hourly instance (above) and samples (right, Hurricane Katrina). Available 3-D parameters are listed below and more are coming.

- Geopotential height
- Air temperature
- 3-D cloud fraction
- Relative humidity
- Specific humidity
- Eastward wind component
- Northward wind component
- Ozone mixing ratio
- Ertel potential vorticity

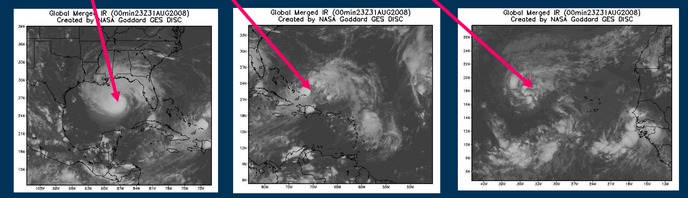
Tools for Supporting the Year of Tropical Convection

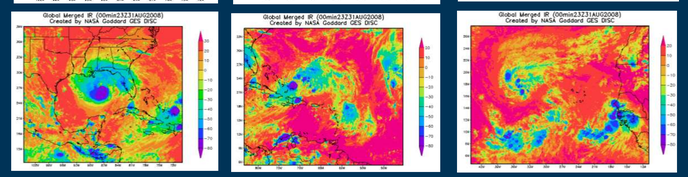
Global merged IR (2000 to present, half-hourly) analysis in Hurricane Data Analysis Tool (HDAT)
URL: http://disc.sci.gsfc.nasa.gov/hurricane/data-holdings/trmm_quikscat_analysis.shtml

Key Features: Customized image or animation; Black/white or false color imagery; Time skip; and Adjustable color bar



A large scale image on August 31, 2008 at 23Z showing Hurricane Gustav, Tropical Storm Hanna and Tropical Storm Ike (from left to right.



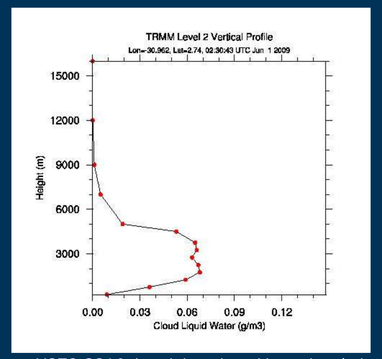


YOTC-GS L2 (a web-based graphics and analysis tool to explore NASA Level 2 data products easily and quickly)
URL: http://disc.sci.gsfc.nasa.gov/YOTC/GS-L2

Key Features: Profiles from TRMM and AIRS; Nearest or inside the grid; Profile data download; and Customized plot

Available Parameters:

TRMM	AIRS
• Cloud Liquid Water	• Air Temperature
• Cloud Ice Water	• Water Mass Mixing Ratio
• Precipitation Water	• Saturated Mass Mixing Ratio
• Precipitation Ice	• Geopotential Height
• Latent Heat	• Saturated Mass Mixing Ratio over Liquid

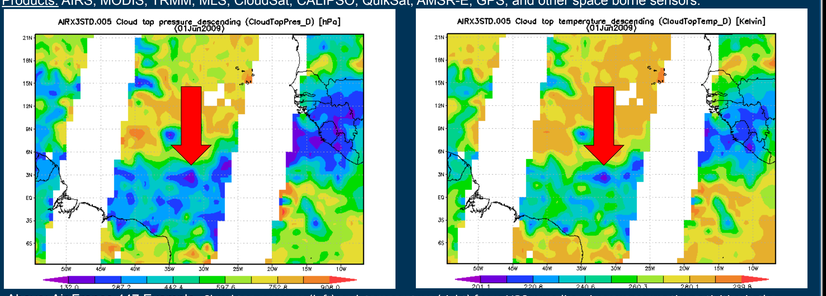


Air France 447 crash example (together with H. Aumann from JPL): On the early morning hours on June 01, 2009 AF 447 disappeared into the Atlantic Ocean, while en route from Rio de Janeiro to Paris, France. Approximately four hours after takeoff, the plane flew through intense mesoscale convective systems at approximately 11 km. The TRMM 2A12 cloud liquid water profile (left) shows a very small amount of cloud liquid water, suggesting that riming due to super-cooled water was not a major cause of the crash.

YOTC-GS L3 (a web-based graphics and analysis tool to explore NASA Level 3 data products easily and quickly)
URL: http://disc.sci.gsfc.nasa.gov/YOTC/GS-L2

Key Features: Lat-lon map, Time series plot , Hovmoller diagrams, Scatter plot, ASCII, NetCDF, HDF outputs, and customization

Products: AIRS, MODIS, TRMM, MLS, CloudSat, CALIPSO, QuikSat, AMSR-E, GPS, and other space borne sensors.



Above: Air France 447 Example. Cloud top pressure (left) and temperature (right) from AIRS revealing vigorous convective activities in the disaster area.